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Achieving Sustainable Development: Accessibility of green buildings in Malaysia

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Abstract

Both Universal Design (UD) and Green Building Design (GBD) aim to achieve sustainability in the built environment. In Malaysia, the introduction of Green Building Index (GBI) is a reinforcement of GBD agenda although not made mandatory to comply. At the same time, the Persons With Disabilities Act 2008 Malaysia (PWD Act) promotes strongly UD. Both the GBI and PWD Act are in support of Sustainable Development (SD) in terms of environmental protection and social equity, respectively. This study provides a critical analysis of how these two SD instruments are either being corroborated or compromised or complemented through the practice of providing accessibility to PWDs in green buildings.

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Keywords: Accessibility; green building; sustainable development; universal design

1. Introduction

For more than forty years, SD has dominated the global environmental discourse and guiding ecosystem protection (Walsh, 2004; EPA, 2008). SD is interpreted and promoted by the initiatives of Health Building, Green Building Congress, Sustainable Building International Conference and Sustainable City International Conference, where SD and human health are the global development goal, with the consideration of "healthiness" and "comfortability", to constructa balance between"sustainability","green" and"healthy" SDenvironment (Chiang, 2005). It can be problematic, however, if there is no connection between a sustainable building and its accessibility, including safety

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and usability by all people (Walsh, 2004; Tay, 2011). The study focuses on the accessibility of the built environment in green buildings in order to achieve the goal of SD in Malaysia's National Five-Year Development Plans. A review of Malaysia legislative, regulative mechanisms and policies in the literature review showed gaps identifying the lack of designing and constructing accessibility for human needs and an imbalance in adopting policies separating accessibility from sustainability. Using case studies, the results showed that disabled users' needs are not accounted for satisfactorily.

2. Literature review

2.1. Sustainable Development (SD): national plans, legislation and policies

SD ensures the well-being of humans by integrating social equity, economic viability, and environmental conservation and protection.According Agyeman (200),Pinfield (1997),Redclift(1987) andCampbell(1996), SD addresses three vital areas:

- People living today are entitled to justice and equal rights
- Environmental degeneration must be eliminated
- Future generations must not be impoverished as a result of current actions

SDconcept was adoptedin Malaysia during the 1992 NGO Forum for RioC10 Malaysia - Chapter of 40 of Agenda 21. Planning byMalaysia constitutes a National Plan where SD was outlined as one of the goals (see Tables 1 and 2).Table 1 shows that accessibility was introduced much later in the Tenth Malaysian Plan where it refers to 'the quality of life'. In the Ninth Malaysian Plan accessibility was mentioned only in general regarding infrastructure. The Town and Country Planning Act included sustainable development as shown in Table 2.

Table 1. Malaysia's National Five Year Development Plans showing SD concepts

Malaysian Plan	Key Emphasis
Seventh Malaysia Plan (1996-2000)	SD
Eighth Malaysia Plan (2001-2005)	SD of energy resources and renewable.
Ninth Malaysia Plan (2006-2010)	SD covering social, economic and environmental aspects.
	Improving*accessibility* to and within the country, enhancing transportation links and communication services and internet at entry points.
Tenth Malaysia Plan (2011-2015)	Improving the standard and sustainability of quality of life through better *access* to healthcare, public transport, electricity and water.
	AFFIRM framework (Awareness, Faculty, Finance, Infrastructure, Research and Marketing) was established to promote the implementation of SD in the construction industry. Green building as part of SD is government's consideration to achieve a better future for next generations (Sood et al., 2011).

Table 2. Planning legislation that referred to SD in Malaysia

Legal Regulation	Remarks
Town and Country Planning Act 1976 (Act 172)	Section 2A (2) National Physical Planning Council. The functions are to promote the framework of the national policy, town and country planning as an effective and efficient instrument for the *improvement of the physical environment* and towards achieving the*SD* Section 8 (3) The statement is to formulatethe policy and general proposals of the State Authority, respecting the development and use of land, including improvement measures of the physical living environment, communications, traffic management, *socio-economic well-being* and the promotion of economic growth, and *for facilitating SD.* (4) In formulating the policy and general proposals under paragraph (3)(a), the State Director shall secure that the policy and proposals are justified by the results of his survey under section 7 and by any other information that he may obtain, and shall have regards to current policies respecting the *social and economic planning and development* and the *environmental protection of the State and the nation*.

Table 3. National policy on the environment and technology in Malaysia

National Policy	Key Emphasis
National Policy on the Environment (2002)	Economic, social and cultural progress through environmentally SD
National Green Technology (2009)	SD
	Energy: seek to attain energy independence and promote efficient utilization
	Environment: conserve and minimize the impact on the environment
	Economy: enhance the national economic development through the use of technology
	Social: improve the quality of life for all

Table 3 shows that the national policies in green environment and technology was created and included the agenda to improve the 'quality of life for all'.

2.2. Green Building (GB)

US Green Building Council states the function of GB is to significantly reduce or eliminate the negative impact of buildings on the environment and the building occupants (LEED, 2004). Golstein (2011) further elaborated that GB is designed for economic and environmental performance, considering the local climate and cultural needs, and providing for the health, safety and productivity of its occupants.

In Malaysia, the Green Building rating system - Green Building Index (GBI) was launched in May 2009, corresponding to the national policies on the environment and technology (Table 3). The GBI was designed based on other international rating systems such as BREEAM (Building Research Establishment Environmental Assessment Method) and the USA's LEED (Leadership in Energy and Environmental Design). The GBI defines GB as to focus on increasing the efficiency of resource use (energy, water and materials) while reducing building impact on human health and the environment through better sitting, design, construction, operation, maintenance and removal . Table 4 compared the different countries objectives focusing on the 'energy efficiency' agenda, however move towards 'renewable energy' and 'social justice' has only been recently addressed in many countries. However, in Malaysia in 2005, the emphasis is still on 'energy efficiency'.

Table 4. Breakdown of different categories in therating systems

Name of Rating Tools	BREEAM	LEED	Green Star	Green Mark	GBI
Origin & years introduced	UK, 1990	US, 1993	Australia, 2003	Singapore, 2005	Malaysia, 2009
Categories	Energy use Transportation Water Ecology Land Use Materials Pollution Health and well being	Energy and atmosphere Water efficiency Sustainable Sites Materials and resources Indoor environmental quality (IEQ) Innovation	Energy Transport Water	Energy efficiency Water efficiency Environmental protection Indoor environmental quality (IEQ) Innovation	Energy efficiency Indoor environmental quality (IEQ) Sustainable Site and management Materials and resources Water efficiency
Developer	Building Research Establishment (BRE)	United States Green Building Council (USGBC)	Green Building Council of Australia (GBCA)	Building and Construction Authority (BCA)	Green Building Index SdnBhd

2.3. Accessibility and Universal Design (UD): definitions and building regulations

The built environment should be designed to cater for Persons with Disabilities (PWD) to promote universal accessibility. PWDs are persons who have long term physical, mental, intellectual or sensory impairments, which in interaction with various barriers may hinder their full participation in society. The seven principles of UD (see Table 5):

Table 5. UD Principles (Center for Universal Design, North Carolina State University, 1997)

Principle	Design description
Equitable use	Useful and marketable to people with diverse abilities
Flexibility in use	Accommodates a wide range of individual preferences and abilities
Simple and intuitive use	Easy to understand, regardless of the user's experience, knowledge, language skills, or concentration level
Perceptible information	Communicates information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
Tolerance for error	Minimizes hazards and the adverse consequences of unintended actions.
Low physical effort	Used efficiently, comfortably and with a minimum of fatigue.
Size and space for approach and use	Appropriate size and space for approach, reach, manipulation and use regardless of the user's body size, posture or mobility.

Table 6. Regulative instruments of accessibility in Malaysia.

Legal Regulation	Year	Key words / phrases quoted
Act:		
Street, Drainage and Building Act 1974 (Act 133)	1991	Section 3 – Interpretation "frontage" means the owner of premises fronting on, adjoining, abutting on, or adjacent or accessible to a street or back lane or where the owner of the premises by himself or his tenant has the right to use or commonly does use the street or back-lane as a means of access to or drainage from the premises. Section 9 (7b) – Private persons making new streets Any person without the permission in writing of the local authority plants any hedge in such manner that any part thereon is in any direction less than twenty feet from the centre of the carriageway of any street, not being a public street, or less than forty feet from the opposite side of any road or path which is used or intended to be used as the means of access to two or more houses exclusive of the width of any footway which the local authority requires should be liable on conviction to a fine not exceeding two thousand ringgit, and a Magistrate's Court shall, on the application of the local authority, make a mandatory order against the offender. Section 12 – Declaration of public streets Where street works have been executed to the satisfaction of the local authority under this Part in respect of a private street, which is not less than forty feet wide, then on the request in any other case, of the several frontagers of such private street or part of a private street as together have an annual value of more than fifty per centum of the total annual value of the premises fronting on, adjoining, abutting on or adjacent or accessible to such private street or part of the private street, as the case may be.
Town and Country Planning Act 1976 (Act 172) amended act 1995 (Act A 933)	1995	Section 21. Application for planning permission (3) Where the developer involves the erection of a building, the local planning authority may give written directions to the applicant in respect of any of the following matters, that is to say the owner of the premises by himself or his tenant has the right to use or commonly does use the street or back-lane as a means of access to or drainage from the premises.
PWD Act 2008 (Act 685)	2008	Section 2. Interpretation "Universal Design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design and shall include assistive devices for particular groups of PWD where this is needed. Part IV. Promotion and development of the quality of life and wellbeing of PWD. Chapter 1 Accessibility. Section 26 – Access to public facilities, amenities and services and buildings. PWD shall have the right to access to and use of, public facilities, amenities, services and buildings open or provided to the public on equal basis with persons without disabilities, but subject to the existence or emergence of such situations that may endanger the safety of PWD For the purposes of subsection (1), the Government and the providers of such public facilities, amenities, services and buildings shall give appropriate consideration and take necessary measures to ensure that such public facilities, amenities, services and buildings and the improvement of the equipment related thereto conform to universal design in order to facilitate their access and use by PWD Section 27 – Access to public transport facilities Section 28 – Access to education Section 29 – Access to employment Section 30 – Access to information, communication and technology Section 31 – Access to cultural life Section 32 – Access to recreation, leisure and sport
Rule:		
Uniform Building By-Law 1984 By Law 34A(1) Amended in 1991	1991	By-Law 34A(1) All public buildings shall provide with access to enable disable persons to get into, out of and within the building & be designed with facilities for used by disabled persons. The requirements of this by-law shall be complied with MS 1184 and MS 1183.
	2005	By-Law 35. Access from a street. Every building to be erected on a site which does not front a street shall have access from a street and the means, nature and extent of the access shall be in accordance with a layout plan approved by the competent planning authority or the local authority.

In Malaysia, regulative instruments that promote UD and accessibility for PWDs have existed since 1990 with the adoption of Malaysian Standards, and in 2008, the PWD Act was enacted (Table 6). A comparative analysis of the building regulations and legislation against the general PWD Act showed some similarities regarding the definitions, where the word 'access' and 'accessible' is used, however, only in 2008 the PWD Act expanded and included UD as the definition for 'access'.

After UD was defined in the PWD Act in 2008, this in turn influenced the policies in Malaysia after the establishment of the PWD Act (Yaacob, Hashim, 2010, 2010a). Before 2008, the use of the word 'access' and 'accessible' is limited in that it was left for interpretation by the architect, and it was stated that, "there are buildings that do not incorporate MS although it has been addressed in the Uniform Building By-law" (UBBL) (Arikisamy, 2007). In addition, "existing public buildings that have done modifications as approved by the standard codes are very few" (Chen et al., 2007; Syazwani et al., 2012).

The incorporation of UD in the PWD Act paved a way to combine and make SD policies in Malaysia to be clearer in the implementation aspects for the 'quality of life for all'. Currently, the Malaysian example could be contrasted with the City of Columbus and Franklin (USA), where the establishment of the AWARE Manual for Sustainable Accessible Living incorporated GB and UD in Sustainable Rating System (City of Columbus and Franklin County, 2013). Another UD and Green Home Survey Checklist developed by Sandler (2010) are designed for building livable, energy-efficient homes and apartments that people of all ages and abilities can use, enjoy and adapt to suit their changing needs. Other countries may still lag behind in this endeavor, due to legislational, attitudinal, professional conducts (Samari et al., 2013), which arguably includes Malaysia.

3. Case study

The objectives are to examine the condition of the facilities provided and to examine the compliance to the requirement of UD in MS prior to achieving the goal of SD in MalaysiaNational Five Year Development Plans. The level of provision and functional of the facilities in the case studies building is evaluated.

3.1. Methods

Data collection was made via direct observation using access audit checklist. The access audit checklist was created to be based on the Malaysian standards and the UBBL(Yaacob, Omar, Rahim et.al. (2011); Yaacob, Hashim, Hashim 2009) to assess the fit between the building users and the built environment.This can helped to identify workplace design factors that might be barriers to users with disabilities, as well as users not yet experiencing a disability. The area assessedare divided into two sections: external environment (pedestrian walkway, disabled car park, external ramp, external step ramp, general obstruction and external staircase) and internal environment (building entrance foyer, doors, room & spaces, barrier free toilet, barrier free shower area, urinal area, fire escape, corridors, internal step ramp, internal ramp, staircase, lift, special telephone,ATM, directional sign & symbol, guiding block, restaurant &cafeteria and others). Video recording and photos are taken for further qualitative analysis of the current facilities condition.Three government office buildings were assessed:

- Kettha Low Energy Office (LEO) in Putrajaya and PTM Green Energy Office (GEO)in Bangiare two green certified government office buildings, located in non-residential existing building (NREB) category and non-residential new construction (NRNC) category, respectively.
- The Ministry of Women, Family and Community Development (KPKWM) in Putrajayais a non-green certified building, chosen according to the consideration of UD and accessibility of PWD during pre-construction stage.

3.2. Analysis and findings

The results showed that KPWKM building (score of 65 of 90) provides better accessibility to building users, followed by LEO(score of 51 of 90)and GEO (score of 44 of 90) (see Table 7).This means, the majority of the facilities provided in the KPWKM meets 75% of the requirements while less than 50% for the facilities in GEO building. The best practice facility provided is barrier free toilet, while the worst practice is lacking installation of guiding block and special phone.

The findings are divided in two: Firstly, way-finding and secondly, architectural design elements. The issues of way finding elements like signages, guiding block and Braille information are found in three buildings. Signage and signals are a problem to recognize accessibility signs for building users. Both the LEO and GEO buildingssignages' size are too small and are not installed at 'decision-making' location. The fire staircase at latter building is not accompanied with a pictogram or fire escape plan for building users. Voice announcement and tactile signs are not installed for users who are vision impaired. The signages installed at KPWKM are easily identified and Braille information are accompanied at certain signages if necessary. In addition, the importance of the guiding block in enhancing the accessibility of people with vision impaired andpeople with learning disability were neglected in three buildings.

Table 7. Findings of direct observation using access audit checklist

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	Total Score
LEO										-			-	-				-					51/90
GEO										-			-	-				-					44/90
KPWKM										-			-	-				-					65/90

Legends for score:

	Score	Description
	1	All requirements are not met / facility is not provided even though it is necessary
	2	25% of the requirements met
	3	50% of the requirements met
	4	75% of the requirements met
	5	All requirements met / facility is not provided, but it is not necessary

Legends for environments:

	Internal Environment		External Environment
a	External barrier free pedestrian walkway	f	Building entrance foyer
b	Disabled car park	g	Door
c	External step ramps	h	Room & spaces
d	External ramp	i	Barrier free toilet
e	External staircase	j	Barrier free shower area
		k	Urinal area
		l	Fire escape
		m	Internal step ramp
		n	Ramp (interior)
		o	Staircase (interior)
		p	Lift
		q	Special phone
		r	ATM
		s	Directional signage & symbol
		t	Guiding block
		u	Restaurant & cafeteria
		v	Bus & taxi station

Table 8. Summary of findings

	GEO	LEO	KPWKM
Accessibility:			
Vision Impaired:	Inaccessible	Inaccessible	Moderate access for people with vision impaired. Lacking of connecting guiding block & information Braille from one space to another.
People with physical / mobility impaired	Difficult to access	Moderate access	Accessible
Learning Difficulties	Difficult to access	Difficult to access	Accessible
Hearing Impaired	Difficult to access	Difficult to access	Accessible
Able People	Accessible	Accessible	Accessible
Safety:			
	Difficult All fire staircases were locked due to security reason. Certain fire extinguishers are not installed at the designated area.	Moderate Lacking of safety curb at external pathway.	Acceptable
Usability:			
	Difficult External ramp, footpath, driveway &signages are not in accordance to UBBL & M.S. Savings are seen in both energy and water.	Moderate Pathway, staircase, ramp and internal way-finding	Acceptable

Both LEO and GEO did not install any guiding block while it is provided at KPWKM's drop off area. However, theconnectivity was not properly done and is missing between the drop off area to the lobby's entrance and adjacent bus station at KPWKM building. In terms of architectural design elements, many problems are identified at the staircase and ramp. The staircase posed major 'usability' problems for persons with mobility impairment, visions impairment and learning difficulties. The fire escape staircases at GEO were locked due to security reasons and this is useless for the purpose of fire escape. Other issues found in both LEO and GEO staircases were the handrails that did not provide accurate tactile and sensory cues to show the presence and locations of steps / landing. Building users might not be able to grab the handrails if they lose their balance momentarily at the landing as the handrails of the staircase were lacking with the required 300mm horizon extension parallel to the floor at the top and bottom risers. The sloped walking surface at both LEO and GEO buildingsproved difficult for wheelchair users to use when approaching the pedestrian walkway. In addition, extra efforts were required to access the external ramp by the wheelchair users as the gradient of the ramp is not in accordance to the MS's requirement.

4. Limitations of the study

Direct observations using the access audit checklist provides a standard way of getting data where the researcher tried to obtain as close as possible reliable data to truly examine the research objective. Due to time and costs constraints, participant observation technique, using real disabled persons would have been a more reliable technique. A simulation exercise using wheelchairs and blindfold of a researcher was conducted instead. Although limited, it was able to give a more diverse set of data rather than just ticking boxes for the access audit checklist.Another limitation is one of the case study government office buildings was not cooperative and gave limited access for the researcher, who managed to however got access to main areas and not all areas.

5. Recommendations and conclusion

GB should be fully accessible in order to fully compliant to the goal of the National Five Year Development Plans. Both LEO and GEO buildings were designed for persons who do not have sensory problems whereas persons lacking sensory abilities were not designed for. It is highly advisable for both building managements to plan and provide solutions and facilities for accessibility, communication and information formats in visual, auditory and tactile form. KPWKM building was designed, in comparison to the green-certified buildings to be more accessible to all users but still not accessible for vision-impaired persons, especially for the connectivity aspects to the surrounding environment. SD includes 'social equity' apart from 'economic viability' and 'environmental sustainability' thus requiring continuous changes to achieve development and redress the imbalance of green-certified buildings objectives. It is recommended that Government interventions be in placed in terms of regulatory and monitoring support including incentives and proper guidelines is also encouraged. To ensure successful implementation of SD, the introduction of GB compliance to the regulatory requirements including accessibility standards for all different and diverse needs are very necessary to achieve the aim stipulated in the PWD Act Malaysia for equal opportunities to be given for all in all areas of life.Future studies recommended based on the results of this study is to perform a qualitative research using case studies by interviewing disabled persons including those with sensory impairment in terms of using green-certified buildings, from the perspective of employment.

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